Notebook, N-99-00-00.3

N-(99-00-003)

Experiments on Zn – Ni – Battery.

Essential for the Operation of such cell is an accumulation of the following three conditions. —

1). That the Anion in question is a. conductor.

2) That it does not dissolve during Electrolysis in either direction.

$Zn(OH)_2$ and any Nickel hydrate

3) That Electrolysis between inactive poles does not change the chemical constitution of the said Anion (or – that if a change takes place, this process is reversable

The behaviour of the electrolyte in regard to 1 is shown in column 3 & 4. —

The voltages given are combination of voltage of decomposition of the Amine b) gas Polarisation c) Resistance drop.

The test regarding 2) is effected by evaporating a filtered sol, that has been in contact with freshly precipitated $Zn(OH)_2$ and noting Residue (Last column)

3) is partially answered in 5, 6, 7
5 & 6 giving estimated percentage

of theoretical amount of gas evolved at the poles. —

N°	Name & Formula	Prelim. Conductivity Test. mill. a.	Volts	Amount of gas set free on polarization anode	cathode	Remarks on appearance of anode	Relative Cond.	Remarks
1.	Aethylenediamine	17 m/A.	7 V.	0.	100%	Yellow coating on anode		Reaction on top
2.	Hexamethylene amine	17.	9.	10%	100%	Bubbles normal		Slight reaction
3.	Diaethylamine	17.	8	10%	100%	"		Reaction
4.	Isobutylamine	17.	7.	10%	100%	"	"	"
5.	Trimethylene diamine	17.	4½	100%	100%	"	"	dissolves $Zn(OH)_2$ readily.
6.	Cyandiamin	17.	4.	nearly 100%	100%	"	"	Slight reaction
7.	Triaethylamine	17.	6.	0.	100%	No Reaction i.e. $Zn(OH)_2$ insoluble.		
8.	Tetraaethylam. Hydroxide							No Reaction!

9.	Tetramethylamin hydrat	17.	4½	40%	100%	Normal ~~dark brown deposit~~ ~~on + pole~~	No Reaction
10.	Tetriaethylamin	17.	4½	40%	100%	dark brown deposit on + pole	no Reaction
11.	Tetraaethyloxy aethylenamin	17.	4½	30%	100%	Normal	No Reaction
12.	Tetramethyloxy methylenamin	17.	4½	20%	100%	Normal	No Reaction
13.	Tetraaethyl Ammon hydrat	17.	3.	10%	0%.	Strong deposition — pole	No Reaction
14.	Diallylamin	17.	6.	10%	100%.		Reaction
15.	Triaethylamin	17.	4.	100%	100%	Strong deposit on + pole	slight Reaction
16.	Benzylamin	17.	9.	5%.	100%	normal	No Reaction

17. Propylamine 17½ 6 . 0. 100% [illegible] [illegible]

18. Triallylamin 17 4 100% [illegible] [illegible] [illegible]
Large 0 bubbles.

19. 20% Koh 18 . 3.25. 200% 100% Normal Dissolves
Completely.

Positiven [illegible] [illegible] Ni.

— + Nickel [illegible]

2. Idee.

Nickelhydroxyd mit [illegible] [illegible] ungiftig. Die Oxydation sollte ein org. Säure radikal bilden, das auf dieser Nickelsalz lösend einwirkt. Im [illegible] selbst ist eine Lösung die vielleicht überschüssig von Säure vorhanden sobald alkalische Lösung damit in Berührung kommt wird Ni. OH. präcipitirt.

Aethylendiamin

18.5. 4.5.1. 1

Hexamethylenamin

18.5. 4.8.8. 2

Benzylamin

18.5. 4.8.8. 3

Triallylamin

18.5. 4.3.1. 4.

Tetraallylammoniumhydroxyd

18.5. - 4.2.2. 5

Trimethyloxymethylenamin

18.5.4. No 4. 6

~~From~~ The

No 1. + 4 [illegible] saturated
with oxygen during 16 hours
[illegible] reversed for a few
minutes (by mistake) This changing the
appearance of the solution [illegible].
As soon as the [illegible] is a clear [illegible]
the oozing out of [illegible]
hydrate is otherwise, while the [illegible]
is surrounded by flocks of white —
may be [illegible] back from
the solution

4) Triallylamin - 5) Tetraallylamin OH
6) Trimethyloxymethylenamin

[illegible] [illegible] current during
24 hours no ozone and [illegible]
[illegible] $10 \frac{m}{A}$ —
Electroden [illegible] 1" + 1/4" [illegible]
96 $\frac{m}{A}$ benutzt werden, [illegible]
[illegible] [illegible] hergestellt.
[illegible] 25 $\frac{m}{A}$ durchgeleitet.
Der Strom wurde abgeschaltet —
[illegible] [illegible] [illegible] nach [illegible]
2 Stunden durchgeleitet
[illegible] 40 $\frac{m}{A}$ durchgegangen
Während mehrerer Stunden
schien keine Veränderung vor
sich zu gehen.

Strom reversed — [illegible]
wächst, folgend [illegible] [illegible]

Following Solutions tested
with Pt. Electrodes, taking
$10 \frac{m}{A}$. $\overset{\text{Current}}{\text{Tension}}$
Trimethyloxymethylamin
V 3.8. about 10% O at + [illegible]
Triaethylamin
5% at + V. 3. 8.
Tetraethylamin OH. 10% O at
+. forms heavy, spongy deposit.
Isobutylamin very little gas
V 6.0.

Propylamin

Trocken Depression at + pos. V. 4.3.

Triäthylamin

[illegible] Depression V. 3.1.

Cyandiamin.

+ 80% O. V. 3.8.

[THIS BOOK WAS USED IN BOTH DIRECTIONS. THE FOLLOWING PAGES WERE FILMED FROM THE BACK END FORWARD.]

Agat Analyse.

I angewandt 1.920

1.900

II Sodium Carb. 8 g

mit Deckel Pt-Tiegel 24.833.

mit SiO2. 25.850

1.017

$Na_2SiO_3 : SiO_2 = \frac{46 + 28 + 48}{122} : \frac{28 + 32}{60}$

1.017 : 1.9 = x : 100

1.0170 : 1.9 . 53.50.

95

67

57

100

Pt Tiegel mit Eisen & Alumin.

25.08
24.833
.247

$Al_2O_3 + Fe_2O_3$

Porzellan Tiegel mit Deckel.

mit 16.020.

MnS. 16.100
.89

~~0.08 : 1.92~~ = x : 100

8.00/1.92 = 4.22%
768
320
384

4.2 : SnO_2
MnO_2 4.01 As_2O_3
.02 SiO_2
53.5

MnO_2 0.089
SnO_2 0.77 .5.
As_2O_3 163
Fe_2O_3 84.
Al_2O_3 1.017
1.265

.089
77
5
163.
1.017
80 MnO_2

Porzellan Tiegel mit Deckel

17.868

mit $SnAs$ 17.950

SnS .082
.077

nach dem glühen 17.945

As Schwefel As .5

Pt. mit Fe_2O_3 24.996.
24.833
.163

.247
163
Al_2O_3 .84

As_2S_2 : As_2O_3

0.005 : 1.900 = x : 100
.500 : 100 = 0.02
540

0.077 : 1.92 = x : 100
~~7.677 1.92~~ = 0.
7.70 : 1.92 = 4.00% SnO_2
7.68
.02

0.2% As_2O_3

$2\,Fe_2O_3 : 4\,FeOSiO_2$

53.5 SiO_2.

.163 : 1.9 = x : 100

$2\,Fe_2O_3 : 4\,FeOSiO_2$ = 0.163 : x

56 × 4 = 224
16 × 6 = 96
224 + 96 = 320

224, 28 × 4 = 112, 16 × 8 = 128
112 + 128 = 480 = 0.163 : x

480 × .163
1440
2880
480
78.240 : 320 = 0.245.
640
1424
1280
1440

Silicat of Iron = 0.245 : x

0.245 : 192 = x : 100 17.98 %

24.500 : 192
192
530
584

$4\,FeOSiO_2$ $4\,SiO_2$
28
32
60

980 : 240 = 0.245 : x
240
9800
4900
~~4700~~
58800

14.700 : 480 0.

Al_2O_3 : ~~[illegible]~~ = .84 : 25

56
48

28 84 144

4.8 : 282 = ~~[illegible]~~ 1.01%

0.084 0.084 : x
1128
2256
236.88 : 48 = 0.493.

48 :

1.017
0.245
1.872

192
448
432
168

0.493, 192 = x : 100
49.30 = 192 = 25

0.493 : ~~[illegible]~~ = 384 = $Al_2Si_2O_7 : SiO_2$
= 1090

28
32
60

1.017
282
2034
8136
2034
286.794 : 60 =
0.493
29.580

0.084
~~Al_2O~~3 : 1.92 = x : 100

8.40 : 1.92 = 4.40
768
720

$Na_2O\,Al_2O_3\,6\,SiO_2$

58800 : 480 : 240 = 0.245 : x
480
1080
960
1200

4.8 = 1.23,

~~Al Silicat 25 %,~~
~~Al_2O_3 4.40.~~
Iron Silicat 11.98.
Mn_2O_2 4.21
SnO_2 4.01 %
As_2O_3 0.02 %

Al_2O_3 4.40%.

Silicate of Iron 11.98%.

Manganese oxyde 4.21.

Tin oxyde 4.01.

As_2O_3 0.02%

~~Sodium Silicate 75 — %~~

~~99.62 %~~

$Na_2O\ Al_2O_3\ 6SiO_2$

46 28
16 6
56 168
48 32
200

Al Silicate 25.32%
Iron Silicate 11.98%

Manganese oxyde 4.21%
Tin oxyde 4.01%
As_2O_3 0.02%
Silicate of Sodium 54.30%
99.84

.163 : 1.9 = x : 100

163 : 19 = 8.6
152
110
114

Fe_2O_3 8.60%
Al_2O_3 : 4.44%
SiO_2 53.50%
x : 100
4.22%
MnO_2.
4.01%
CaO
0.02%
As_2O_3
Na_2O 25. %

Al_2O_3 .084 : 1.9 = 4.44

84 : 19 = 4.4
76
80
76
40